

Amendments to the claims:

Please replace all prior versions and listings of the claims with the following amended claims:

- 1 1. (Original) A method of depositing a metal film on a substrate comprising the steps
2 of:
3 a. maintaining supercritical carbon dioxide and a chelating agent in contact with the
4 substrate to remove an oxide layer from a metal surface of the substrate, thereby
5 forming a precleaned substrate; and
6 b. depositing the metal film on the precleaned substrate without exposing the
7 precleaned substrate to a material which oxidizes the metal surface of the
8 precleaned substrate.

- 1 2. (Original) The method of claim 1 wherein the step of maintaining the supercritical carbon
2 dioxide and the chelating agent in contact with the substrate further comprises
3 maintaining an acid in contact with the substrate such that the acid dissolves the oxide
4 layer.

- 1 3. (Original) The method of claim 2 wherein the acid is selected from the group consisting
2 of an organic acid and an inorganic acid.

- 1 4. (Original) The method of claim 2 wherein the oxide layer comprises a copper oxide.

- 1 5. (Original) The method of claim 4 wherein the acid comprises an organic acid.

- 1 6. (Original) The method of claim 4 wherein the acid is selected from the group consisting
2 of acetic acid, formic acid, oxalic acid, malonic acid, alpha hydroxy acid, glycolic acid,
3 citric acid, malic acid, lactic acid, amino acid, glycine, alanine, leucine, valine, glutamine,
4 and lysine.

- 1 7. (Currently Amended) The method of claim 2 wherein the oxide layer comprises an
2 aluminum oxide.
- 1 8. (Original) The method of claim 7 wherein the acid comprises an inorganic acid.
- 2 9. (Original) The method of claim 7 wherein the acid is selected from the group consisting
3 of hydrofluoric acid, buffered hydrofluoric acid, ammonium fluoride, and ammonium
4 bifluoride
- 1 10. (Original) The method of claim 1 further comprising the step of maintaining the
2 supercritical carbon dioxide in contact with the substrate to desorb an adsorbate from the
3 substrate prior to the step of depositing the metal film.
- 1 11. (Original) The method of claim 10 wherein the step of maintaining the supercritical
2 carbon dioxide in contact with the substrate desorbs an adsorbate from the substrate.
- 1 12. (Original) The method of claim 1 further comprising the step of maintaining the
2 supercritical carbon dioxide and a solvent in contact with the substrate to remove a
3 residue selected from the group consisting of a photoresist, a photoresist residue, and an
4 etch residue from the substrate prior to the step of depositing the metal film.
- 1 13. (Original) The method of claim 1 wherein the chelating agent is selected from the group
2 consisting of 2,4-pentanedione, 1,1,1,6,6,6-hexafluoro-2,4-pentanedione,
3 1,1,1-trifluoropentane-2,4-dione, 2,6-dimethylheptane-3,5-dione,
4 2,2,7-trimethyloctane-2,4-dione, 2,2,6,6-tetramethylheptane-3,5-dione, ethylenediamine
5 diacetic acid, and nitrilotriacetic acid.
- 1 14. (Original) A method of depositing a metal film on a substrate comprising the steps of:
2 a. maintaining supercritical carbon dioxide and an amine in contact with the
3 substrate to remove an oxide layer from a metal surface of the substrate, thereby
4 forming a precleaned substrate; and

- 5 b. depositing the metal film on the precleaned substrate without exposing the
6 precleaned substrate to a material which oxidizes the metal surface of the
7 precleaned substrate.
- 1 15. (Original) The method of claim 14 wherein the amine is selected from the group
2 consisting of triethanolamine, 2-methylaminoethanol, pyridine, 2,2'-bipyridine, and
3 pentamethyldiethylenetriamine.
- 4 16. (Original) The method of claim 14 further comprising the step of maintaining the
5 supercritical carbon dioxide in contact with the substrate to desorb an adsorbate from the
6 substrate prior to the step of depositing the metal film.
- 1 17. (Original) The method of claim 16 wherein the step of maintaining the supercritical
2 carbon dioxide in contact with the substrate desorbs an adsorbate from the substrate.
- 1 18. (Original) The method of claim 14 further comprising the step of maintaining the
2 supercritical carbon dioxide and a solvent in contact with the substrate to remove a
3 residue selected from the group consisting of a photoresist, a photoresist residue, and an
4 etch residue from the substrate prior to the step of depositing the metal film.
- 1 19. (Previously Presented) A method of depositing a film on a substrate comprising the steps
2 of:
3 a. maintaining supercritical carbon dioxide from a first module in contact with the
4 substrate to remove a sorbate selected from the group consisting of an adsorbate
5 and an adsorbate from the substrate, thereby forming a desorbed substrate; and
6 b. depositing the film on the desorbed substrate from a second module, wherein the
7 substrate is transferred from the first module to the second module through a
8 valve without exposure of the substrate to a surrounding environment.
- 1 20. (Original) The method of claim 19 where in the film comprises a metal film.

1 21. (Original) The method of claim 20 further comprising the step of maintaining the
2 supercritical carbon dioxide and a chelating agent in contact with the substrate to remove
3 an oxide layer from a metal surface of the substrate prior to the step of depositing the
4 metal film on the substrate.

1 22. (Original) The method of claim 21 wherein the step of maintaining the supercritical
2 carbon dioxide and the chelating agent in contact with the substrate further comprises
3 maintaining an acid in contact with the substrate such that the acid dissolves the oxide
4 layer.

1 23. (Original) The method of claim 20 further comprising the step of maintaining the
2 supercritical carbon dioxide and an amine in contact with the substrate to remove an
3 oxide layer from a metal surface of the substrate prior to the step of depositing the metal
4 film on the substrate.

1 24. (Previously Presented) The method of claim 20 further comprising the step of
2 maintaining the supercritical carbon dioxide and a solvent in contact with the substrate to
3 remove a residue selected from the group consisting of a photoresist, a photoresist
4 residue, and an etch residue from the substrate prior to the step of depositing the metal
5 film.

1 25. (Original) A method of depositing a metal film on a substrate comprising the steps of:
2 a. maintaining supercritical carbon dioxide in contact with the substrate to remove a
3 sorbate selected from the group consisting of an absorbate and an adsorbate from
4 the substrate;
5 b. maintaining the supercritical carbon dioxide and a chelating agent in contact with
6 the substrate to remove an oxide layer from a metal surface of the substrate; and
7 c. subsequently depositing the metal film on the substrate without exposing the
8 substrate to a first material which forms a nonvolatile sorbate prior to depositing
9 the metal film and without exposing the substrate to a second material which
10 forms the oxide prior to depositing the metal film.

1 26. (Original) The method of claim 25 wherein the step of maintaining the supercritical
2 carbon dioxide and the chelating agent in contact with the substrate further comprises
3 maintaining an acid in contact with the substrate such that the acid dissolves the oxide
4 layer.

1 27. (Original) The method of claim 25 further comprising the step of maintaining the
2 supercritical carbon dioxide and a solvent in contact with the substrate to remove a
3 residue selected from the group consisting of a photoresist, a photoresist residue, and an
4 etch residue from the substrate prior to the step of depositing the metal film.

1 28. (Original) A method of depositing a metal film on a substrate comprising the steps of:
2 a. maintaining supercritical carbon dioxide in contact with the substrate to remove a
3 sorbate selected from the group consisting of an absorbate and an adsorbate from
4 the substrate;
5 b. maintaining the supercritical carbon dioxide and an amine in contact with the
6 substrate to remove an oxide layer from a metal surface of the substrate; and
7 c. subsequently depositing the metal film on the substrate without exposing the
8 substrate to a first material which forms a nonvolatile sorbate prior to depositing
9 the metal film and without exposing the substrate to a second material which
10 forms the oxide prior to depositing the metal film.

1 29. (Original) The method of claim 28 further comprising the step of maintaining the
2 supercritical carbon dioxide and a solvent in contact with the substrate to remove a
3 residue selected from the group consisting of a photoresist, a photoresist residue, and an
4 etch residue from the substrate prior to the step of depositing the metal film.

1 30. (Currently Amended) A method of depositing a metal film on a substrate comprising the
2 steps of:
3 a. maintaining supercritical carbon dioxide, a chelating agent, and an acid in contact
4 with the substrate such that the acid dissolves an oxide layer from a metal surface

5 of the substrate and further such that the chelating agent carries away [[meal]]
6 metal ions, thereby forming a precleaned substrate; and
7 b. depositing the metal film on the precleaned substrate without exposing the
8 precleaned substrate to a material which oxidizes the metal surface of the
9 precleaned substrate.

1 31. (Currently Amended) An apparatus for depositing a metal film on a substrate comprising:
2 a. a transfer module;
3 b. a supercritical processing module coupled to the transfer module;
4 c. a metal deposition module;
5 d. a vacuum module coupling the metal deposition module to the transfer module;
6 [[and]]
7 e. means for transferring the substrate between the supercritical processing module
8 and the metal deposition module; and
9 f. an inert gas injection arrangement coupled to the transfer module such that in
10 operation the transfer module provides an inert gas environment.

1 32. (Original) The apparatus of claim 31 wherein the transfer module comprises an entrance
2 and a first robot.

1 33. (Original) The apparatus of claim 32 wherein the entrance comprises a loadlock.

1 34. (Canceled).

1 35. (Original) The apparatus of claim 33 further comprising a vacuum pump coupled to the
2 transfer module such that in operation the transfer module operates at vacuum.

1 36. (Original) The apparatus of claim 32 wherein the vacuum module comprises a second
2 robot.

1 37. (Original) The apparatus of claim 36 further comprising a valve, the valve coupling the
2 transfer module to the vacuum module.

1 38. (Original) The apparatus of claim 37 further comprising a vacuum pump coupled to the
2 vacuum module.

1 39. (Original) The apparatus of claim 36 further comprising a loadlock, the loadlock coupling
2 the transfer module to the vacuum module.

1 40. (Original) The apparatus of claim 31 wherein the supercritical processing module
2 comprises a pressure vessel.

1 41. (Currently Amended) An apparatus for depositing a metal film on a substrate comprising:
2 a. a transfer module comprising an entrance and a first robot;
3 b. a supercritical processing module coupled to the transfer module;
4 c. a metal deposition module; and
5 d. a vacuum module coupling the metal deposition module to the transfer module,
6 the vacuum module comprising a vacuum chamber and a second robot, wherein
7 the first robot and the second robot are configured to transfer the substrate
8 between the supercritical processing module and the metal deposition module.

1 42. (Previously Presented) An apparatus comprising:
2 a. a front transfer module comprising one or more supercritical modules configured
3 to treat a substrate with a supercritical solution;
4 b. a back transfer module coupled to the front transfer module, the back transfer
5 module comprising one or more deposition modules configured to deposit a layer
6 of material onto the treated substrate; and
7 c. means for transferring the substrate between the front transfer module and the
8 back transfer module without exposing the substrate to the environment.

1 43. (Previously Presented) The apparatus of claim 42, wherein the means for transferring the
2 substrate between the first transfer module and the second transfer module comprises one
3 or more transfer robots.

1 44. (Previously Presented) The apparatus of claim 42, further comprising a valve for isolating
2 the substrate within the one of the front transfer module and the back transfer module.

1 45. (Previously Presented) The apparatus of claim 42, further comprising a loader module for
2 introducing the substrate.

1 46. (Previously Presented) The apparatus of claim 45, wherein the loader module is coupled
 to the front transfer module.